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HAZARDOUS WASTES

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16. Abstracts The dangers and problems of hazardous wastes are described in this pictorial booklet that is part of the EPA solid waste management publication series. It is shown that how the nation's hazardous wastes are managed or mismanaged is a crucial environmental issue with vast implications for public health and for the integrity of the ecological systems on which man depends. The environmental folly of dumping or burning these wastes is emphasized, along with the economic imprudence of continuing to throw away valuable resources as wastes. The public as well as industry must pay the costs of safe hazardous waste management.

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The Danger

Hazardous wastes are the particularly dangerous discards of our highly industrialized, science-and-technology-based society. They should be disposed of carefully, but sometimes they are not. Sometimes they are

put in open dumps, in landfills designed only for residential refuse, in the ocean, or they are just left around in warehouses. Consider what can happen:

- A factory begins depositing chemical wastes in a nearby city dump. Chemicals soon work their way into the soil and down into a spring beneath the dump. Then from the spring into a creek. Then from the creek into one of the nation's major rivers. Result: dead fish and wildlife along 10 miles of the meandering creek, a creek so polluted it has to be placed off-limits for livestock, fishing, and recreation. The wastes contained polychlorinated biphenyls (PCBs), a deadly chemical.

- A commercial laboratory dumps some of its wastes on the open ground within the plant. Soon the soil is contaminated. Then the groundwater is contaminated and becomes unsafe for drinking or for irrigation. The company has to drill a system of recovery wells to try to recapture the chemical wastes, which contained arsenic.

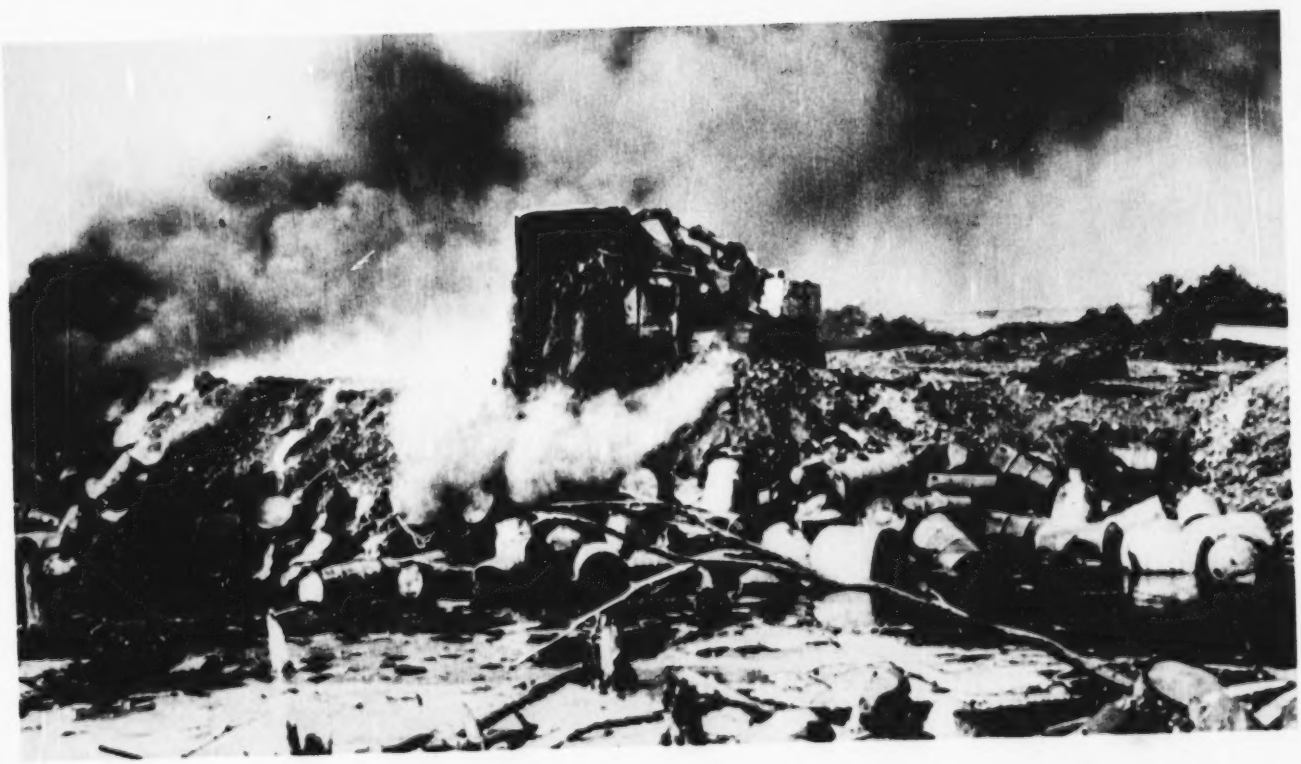
- Cattle kept downstream from a city landfill die.

Tests reveal cyanide in the cattle and in water ponds. Source: cyanide wastes dumped at the upstream landfill.

◉ Shrimpers in the Gulf of Mexico haul in their nets. To their surprise, besides delectable shellfish, the nets contain drums bearing the names of two chemical companies. The leaking drums damage nets and fishing equipment and burn the skin and irritate the eyes of the fishermen. The drums contain toxic chemical wastes.

◉ In the warehouse of a local weed control agency in rural America, someone discovers several drums of a 15-year-old chemical once used to sterilize soil. The drums are taken to a remote area and left there. A rifle shot rings out. A drum explodes. Had the drums been jarred while at the warehouse, several people would have been killed, for the drums of obsolete chemicals had slowly, imperceptibly, turned into time bombs.

◉ At another city landfill, wastes from homes and industries have been dumped and buried for years. The landfill closes. Four years pass. Suddenly, chemical and biological contaminants are detected in the groundwater,



the result of leaching from the landfill. To prevent further deterioration of the underground reservoir that provides drinking water for thousands of people, millions of dollars may have to be spent undoing past damage.

◉ Several people with disturbing symptoms are admitted to a hospital. Tests show they are suffering from arsenic poisoning. Investigations reveal the source: well water contaminated by arsenic waste buried 30 years earlier on nearby farmland.

◉ On the beaches of a Southeastern State, glass containers about 5 to 8 inches long are washed ashore from the Atlantic. Investigators determine that the containers were buried at sea shortly after World War II but were broken free of their crates by undersea turbulence. The public is warned not to touch the easily broken containers; they are filled with carbon disulfide, a gas so lethal it could kill if brought in contact with the skin or if inhaled.

These incidents have several things in common: each was a real-life episode of recent years. The villain each time was a hazardous waste. And each episode occurred because proper control over the storage, treatment, and disposal of hazardous wastes was lacking. They are but a few of the incidents that could be cited to demonstrate the great need for improved control over hazardous wastes.

The United States in recent years has begun to come to grips with the problems of air and water pollution, but the land remains relatively unprotected from many hazardous discards. And as the laws enacted to control air and water pollution are implemented, the pressures on the land are increasing. Many hazardous materials once emitted into the air or dumped in our rivers, lakes, and oceans are winding up on the land. Unless adequately controlled, these substances can eventually get into the air or water nevertheless. Or they can continue indefinitely on the land, still hazardous but often forgotten and unsuspected.

Foreseeing the assault on the land, Congress wrote into the Solid Waste Disposal Act as amended by the Resource

Recovery Act of 1970 a requirement that the Federal Government study the hazardous waste problem and submit a report and recommendations for action. This has been done by the U.S. Environmental Protection Agency (EPA), and legislation to regulate the generation, treatment, transport, and disposal of hazardous wastes is now being formulated by the Congress. Meanwhile, EPA is pursuing a program which includes determining the quantity and composition of hazardous wastes and their sources; identifying and assessing safe treatment and disposal methods; developing criteria for proper processing and disposal of the hazardous wastes; understanding the health and environmental effects of improper hazardous waste management; and relaying to industry and State and local governments information on the state of the art of hazardous waste management technology.

With this booklet, EPA seeks to acquaint the interested public with the scope of the hazardous waste problem and to outline what can be done to safeguard the public and the environment.

The Problem

The fundamental fact about hazardous wastes is that they are a menace to human health and the environment. They can poison, burn, maim, blind, and kill people and other living organisms. They may snuff out life immediately when inhaled, swallowed, or brought in contact with the skin. They may wreak their havoc slowly over time, affecting the nervous system, causing cancers, or spawning birth defects. Some are nondegradable and persist in nature indefinitely. Some may accumulate in living things. Some may work their way into the food chain.

In the water they may kill fish, shellfish, and wildlife. They may wipe out aquatic life on which fish feed. They may damage or kill plants and trees when present in the soil, in the air, or in irrigation water.

A hazardous waste, in short, is any waste or combination of wastes that poses a substantial danger, now or in the future, to human, plant, or animal life and which therefore cannot be handled or disposed of without special precautions.

Hazardous wastes are with us as solids, liquids, gases, and sludges. They may be toxic chemicals, acids, or

caustics. They may catch fire or explode at normal temperatures and pressures or when exposed to air or water. Some may be set off by an electrostatic charge, others by being dropped or jarred. Some are highly sensitive to heat and friction. Hazardous wastes come in many other forms: biological materials, chemical and biological warfare agents, and radioactive materials.

Where do they come from?

Industry generates at least 10 million tons of nonradioactive hazardous wastes a year (this is about 10 percent of all wastes produced by industry), and the amount is growing at a rate of 5 to 10 percent annually. Approximately 90 percent of industrial hazardous wastes are in liquid or semiliquid form. Almost all of the 10 million tons is toxic. Industry's toxic throwaways fall into one or more of these categories: inorganic toxic metals; salts, acids, or bases; synthetic organics; flammables; and explosives.

Some of the toxic metal waste comes from mining and metallurgy and from the electroplating and metal-finishing industries. Copper, lead, and zinc smelting produce about 40,000 tons of arsenic in flue dusts each year. And some 30,000 tons of chromium-bearing wastes are produced by the metal-finishing industry each year.

Synthetic organic wastes include halogenated hydrocarbon pesticides (such as endrin), polychlorinated

biphenyls, and phenols. Some 5,000 tons of synthetic organic pesticide wastes are produced annually. Still another hazard: the approximately 250 million pesticide containers that must be disposed of each year. (Even though a container may be considered empty by the user, there are residue pesticides. People have been made sick and livestock have been killed by coming in contact with "empty" pesticide drums and bags.)

The flammable wastes are mainly contaminated organic solvents. Other wastes that can burn include oils, pesticides, plasticizers, organic sludges, and off-specification chemicals.

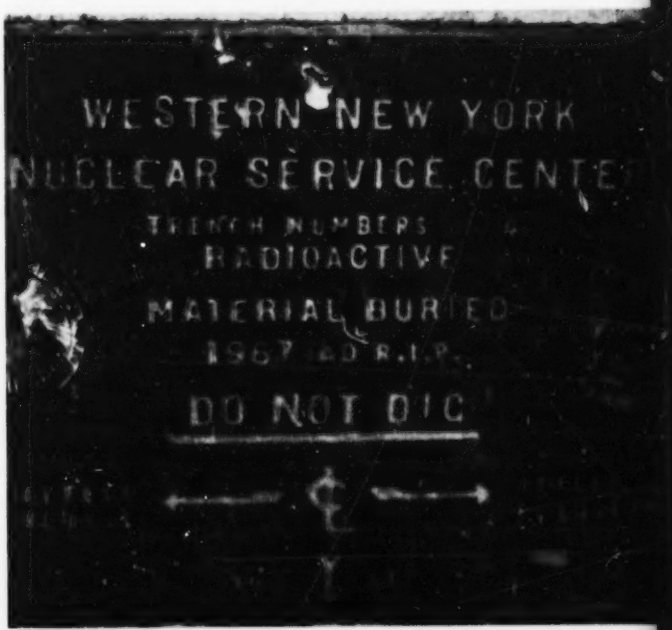
The explosive wastes include obsolete munitions, wastes from the explosives-manufacturing industry, and contaminated industrial gases. The Department of Defense has accumulated some 150,000 tons of obsolete ammunition that used to be

dumped at sea; the discarded bombs, shells, bullets, etc., are now stored pending development of a suitable disposal method.

Hospitals add about 170,000 tons of pathological materials to the hazardous waste load each year. They include human and animal remains, tissue obtained in surgery or for tests, cultures, hypodermic needles, outdated or off-specification drugs, and soiled bandages.

There are biological warfare materials, such as antipersonnel and anticrop viruses and bacteria, and chemical warfare materials that have been stockpiled pending treatment and final disposal. Approximately 70,000 tons of residual salts will be left after chemical warfare agents are properly treated; the salts themselves may be hazardous and will require careful disposal.

And there are radioactive wastes, those high- and low-level residues from nuclear power plants and fuel reprocessing facilities; medical and industrial research labs; and the weapons and research facilities of the U.S. Energy Research and Development Administration and the Department of Defense. Government figures are unavailable because of their correlation with weapons production, but radioactive wastes from the nuclear power industry and other private sources are estimated to total about 24,000 tons a year—and the amount grows as each new nuclear power plant comes on line.



Methods commonly used

There is no known way to render radioactive wastes harmless. They take from months to hundreds of thousands of years to decay into harmless substances. Radioactive wastes, whether in gas, liquid, or solid form, must therefore be contained and isolated and allowed to decay under carefully controlled conditions until and unless methods are developed to "neutralize" the radionuclides. (Radioactive waste disposal is the responsibility of the U.S. Nuclear Regulatory Commission.)

Similarly, some nonradioactive hazardous wastes cannot be neutralized. Some chemical wastes—such as arsenites and arsenic trioxide—must also be stored in secure containers and locations until proper treatment and disposal technology is developed.

However—and this is the key to effective regulation—technology is available today to treat and safely dispose of most nonradioactive hazardous wastes.

A few industrial firms and other waste sources are moving ahead to develop systems for safe management of their hazardous wastes. But aside from these exceptions, the methods currently used are inadequate and create unnecessary hazards.

The most common methods of getting rid of hazardous wastes are dumping them on the land, burying them in the land, injecting them into deep wells, and dumping them in the ocean. Sometimes explosives are detonated and burned in the open. And some organic chemicals, biological wastes, and flammable materials are incinerated. **Each of these commonly used disposal methods is a potential threat to public health and the environment.**

When simply dumped on the land, hazardous wastes may percolate or leach into groundwater and thus contaminate or poison water supplies. They may be carried by rain runoff directly into streams, rivers, lakes, and oceans. They may pollute the air when burned deliberately or spontaneously, or merely when blown about by the wind. They may contaminate food supplies. At some manufacturing plants, hazardous wastes are stored in open ponds or lagoons; those can also pose pollution problems.

Sanitary landfills—where wastes are covered with earth each day—are preferable. But unless specially designed, a sanitary landfill may still pollute surface and ground water, and venting gas may pollute the air.

Injecting hazardous wastes into deep wells can pollute groundwater. (Indeed, EPA policy opposes deep-well injection unless all other alternatives pose even worse environmental dangers and unless extensive hydrological and geological studies assure that groundwater will not be polluted.)

Ocean dumping poses a threat to marine life and the ecological balance of the seas, as well as to humans who come in contact with improperly sealed and weighted hazardous materials dropped into the oceans.

Burning hazardous wastes in open fires or in incinerators or exploding them can pollute the air. And the residues from incineration may themselves be hazardous and thus still require careful disposal.

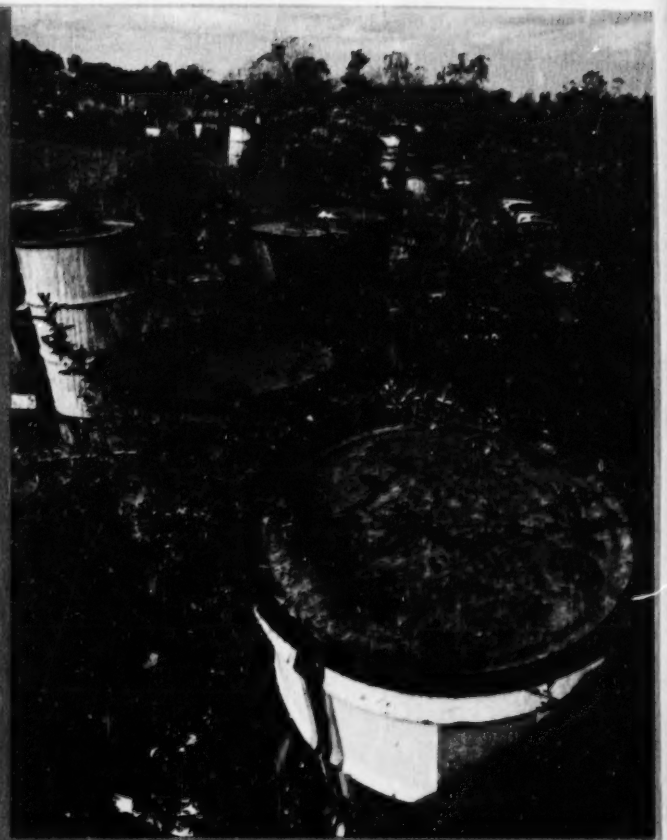
In sum, business as usual in the disposal of hazardous wastes is just not good enough, as the episodes cited at the beginning of the booklet illustrate.

about pesticides

Not too long ago, a 2½-year-old boy was hospitalized in a rural community. The boy's illness was diagnosed as organophosphate poisoning. The boy had been playing in a pile of 55-gallon drums about 50 feet from the front door of his home. The city had obtained the drums from an aerial insecticide applicator and planned to use them as trash containers. In fact, the city had urged residents to come by and pick up a drum.

Investigation showed that the drums contained enough pesticide residues to harm anyone, child or adult, who touched them.

Near-tragic incidents of that kind may now be avoided. Under the Federal Insecticide, Fungicide, and Rodenticide Act, EPA has issued regulations concerning the storage and disposal of pesticides and pesticide containers. Details on the safety requirements for storing and disposing of pesticides and containers are available from EPA regional offices or EPA's Office of Public Affairs, Washington, D.C. 20460.



What Can Be Done?

Although at present there is no direct Federal regulatory authority, Congress is formulating legislation to regulate the generation, treatment, transport, and disposal of hazardous wastes which encompasses several factors: standards for the handling, treatment, labeling, and disposal of hazardous wastes; special disposal sites; enforcement; and using existing technology and stimulating the development of needed new technology to safeguard public health and the environment from the dangers of hazardous wastes.

Several of the State governments have begun to move ahead in regulating hazardous wastes. For example, some States are regulating the transport of hazardous wastes, with a few even requiring reports and records from the waste generators. California, Minnesota, and Oregon have passed comprehensive hazardous waste management legislation. With or without Federal legislation, the States are focal points for proper management of hazardous wastes, and their capabilities must be encouraged to grow.

The available technology for processing hazardous wastes presents an array of possibilities. Using physical, chemical,

thermal, and biological processes, scientists and engineers can extract useful materials from many hazardous wastes and put them back into the production stream. They can convert man's hazardous wastes into harmless materials. They can destroy many hazardous wastes. And as for dangerous residues from these processes (and hazardous wastes for which treatment technology has not yet been perfected), the experts know how to isolate and store them safely.

Physical treatment processes can be used to reduce the volume of wastes at the factory where they are generated. Waste brines can be concentrated by evaporation. Solids can be separated out of liquid wastes. Many soluble organic substances can be removed from liquid wastes by carbon sorption. Following such treatment, the waste can be moved more readily into storage, onto further processing, or to final disposal.

Chemical processes can be used to neutralize some wastes. Toxic metals like arsenic, cadmium, mercury, and antimony can be extracted by sulfide precipitation. Cyanide and chromium in some wastes can be treated with the oxidation-reduction process.

Some liquid and solid hazardous wastes can be destroyed by burning them in special incinerators. Some hazardous wastes can be converted into useful fuel gases, oils, or coke by pyrolysis, a process that chemically decomposes wastes by heating them to a high temperature without oxygen.

Some organic wastes can be rendered harmless by micro-organisms which will feed upon them.

In brief, a rational hazardous waste management program would make maximum use of existing technology to safeguard public health and the environment by:

- Reducing the amount of hazardous wastes generated in the first place.

- Concentrating wastes at the source to reduce handling and transportation problems.

- Stimulating "waste exchange." (One factory's hazardous wastes can become another's feedstock; for

instance, acid and solvent wastes from some industries can be utilized by others without processing.)

- Recapturing and recycling metals, the energy content, and other useful resources contained in hazardous wastes.

- Destroying some hazardous wastes in special high-temperature incinerators equipped with proper pollution control and monitoring systems.

- Detoxifying and neutralizing hazardous wastes destined for land disposal.

- Reducing the volume of those wastes to minimize the amount of land needed for final burial sites.

- Building specially designed landfills, cut off from groundwater and properly monitored and secured, for hazardous materials that have to be buried in the ground.

Such a program will not materialize full-blown at the stroke of a pen. It will require planning and construction of

new treatment facilities at industrial plants. It will require a system of regional treatment and disposal facilities across the nation, especially designed for dangerous wastes that industry cannot dispose of safely. It will require a commitment by industry and government to make the program work. It will require acceptance by the public of the fact that properly located, designed, built, and operated regional treatment and disposal facilities, with extensive monitoring systems and safeguards, will be safe and will greatly reduce the dangers that hazardous wastes now pose to the public.

And it will require public vigilance and support to make sure that government—at all levels—and industry invest the money and manpower needed to regulate hazardous wastes properly.

what can you do?

Concerned citizens, especially those acting through voluntary citizen organizations to work for a cleaner and safer environment, can contribute significantly to wiser management of hazardous wastes. They can help inform the public about the dangers of hazardous wastes, and they can help insure that appropriate action is taken to cope with those dangers.

They can find out what the situation is in their own communities and States: What hazardous wastes are being produced? What are the sources? How are the wastes handled, treated, transported, disposed of? Do control agencies have adequate authority, funds, and staff to implement hazardous waste management laws and regulations?

And they can support, encourage, and stimulate control agencies and industries to move steadily and speedily toward sound hazardous waste management.

Concerned citizens, in brief, can be a vital force in public education for constructive action to cope with hazardous wastes.

A Crucial Issue

How we manage—or mismanage—the nation's hazardous wastes is a crucial environmental issue with vast implications for public health and for the integrity of the ecological systems on which we depend for life itself.

It is environmental folly to continue to dump or burn those wastes irresponsibly. And in an era of growing shortages of many materials, it is economic folly to continue to throw away valuable resources as "wastes."

While recovery and reuse of valuable resources contained in hazardous wastes will offset to a degree the higher price of safe hazardous waste management, environmentally sound treatment and disposal of dangerous materials will, in general, mean higher costs for the generators of those wastes. That, in turn, may mean higher prices for consumers of some products.

But as with air and water pollution control, there are no free lunches. All of us—industry and the general public alike—must be prepared to foot the bill for a safe and healthful environment. The costs and the risks of not bringing hazardous wastes under proper control are infinitely greater.

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further information

Planning for proper regulation of hazardous wastes is one of the responsibilities of EPA's Office of Solid Waste Management Programs. EPA's other functions in the solid waste area include:

- Investigating the total environmental consequences of our mining, manufacturing, marketing, and distribution practices as they affect the waste of resources and air, water, and land pollution.
- Studying and monitoring resource recovery projects to ensure the development of appropriate technology and workable institutional and financial arrangements for maximum recovery and reuse of resources from waste.
- Funding major resource recovery demonstration projects to spur the art of recapturing valuable materials for recycling and fuel from solid wastes.
- Supporting research on the health and safety effects of land disposal of those wastes that cannot be recycled.
- Working with State and local governments to improve solid waste collection practices and to end open dumping of wastes.
- Providing technical assistance and information to State and local governments, and to industry, to speed the application of new technology and environmentally sound waste disposal practices.
- And encouraging the States to strengthen their solid waste and land protection programs through better planning and management.

Information on any or all of these programs is available from the technical information staff of the Office of Solid Waste Management Programs, EPA, Washington, D.C. 20460.

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